The Fanciful Movements of the Sun in Purānas

Octavio da Cunha Botelho

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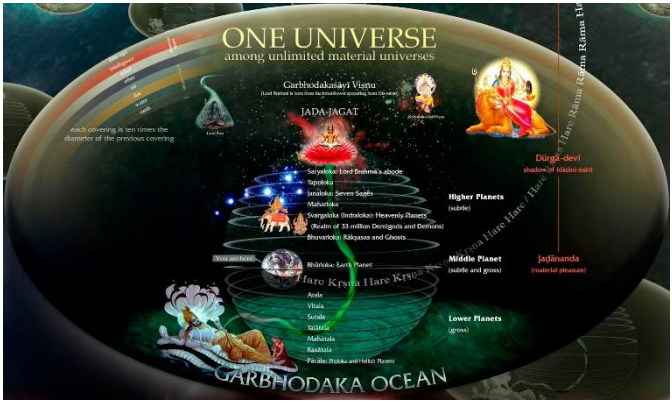
The Religious See the Invisible World Better than the Visible World

Among the many subjects on which religions have speculated in the past, there is the division between those that are distant from our perception, therefore imperceptible, namely: the unknown regions (the celestial planes, the seventh heaven, the hell, the astral world, etc.); the paradises (the Garden of Eden, the Vaikuntha, the mythical Shambala, Mount Olympus, etc.); the extraordinary experiences (nirvāna, samādhi, mystical ecstasy, the seventh heaven, etc.), etc.; and the speculations of the religious on the subjects that are within the reach of the perception of all of us, examples: the creation of the world, the composition of nature, the human body, the history, the firmament, etc. Among these latter subjects, some that have been speculated with curiosity in the past by some religions have been Cosmology and Astronomy, often in the forms of Cosmogony (origin of the universe) or Cosmography (something like a geography of the universe). So, while religious speculations about imperceptible subjects are impossible to be investigated, due to the unreachability, therefore impossible to be demystified, as they are imperceptibles; religious speculations on concrete subjects were possible to be investigated and, many of them, consequently,

were demystified and, the most delusional, denied, due to perceptibility and concreteness.



The ancient authors of Puranas imagined the universe in the shape of an egg

Therefore, it is curious to notice, throughout history, how much has been demystified and disproved about religious speculations on tangible matters, given the impossibility of demystifying religious speculations on imperceptible matters. The comparison leads us to conclude that, if religions have made so many mistakes about concrete matters, which are more visible, therefore less subject to mistakes, how much more the religious may have been wrong in speculations about imperceptible matters, which are invisible, therefore more doubtful. Or, do the religious see the invisible better than the visible? If almost everything that the religious speculated on tangible matters has not been confirmed, the possibility of the religious establish speculations on impalpable matters is

even less. Therefore, among the ancient speculations of the religious on perceptible subjects, Cosmology was one whose confirmations did not occur.

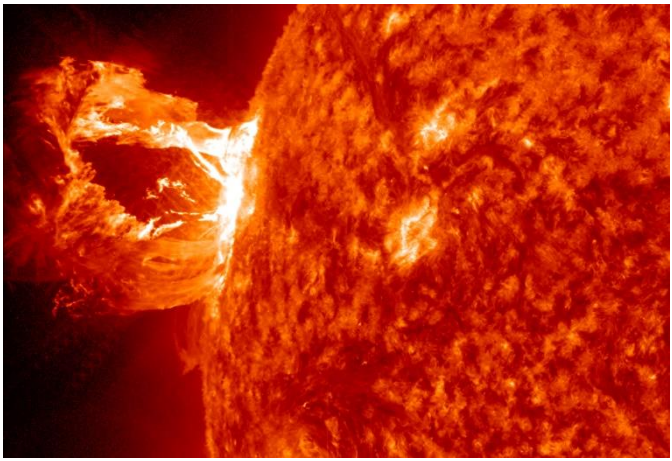
Even so, some Hindus and supporters of the ancient Vedic speculations believe that the ancient mythological cosmology of Purānas still deserves scientific validity or that it represents an astronomical alternative to the current Scientific Cosmology. So that the following paragraphs will show and analyze, without the distortions of the translations and the interpretative manipulations of the translators and interpreters, in order to modernize the puranic ideas, some examples of immense non-conformity between the knowledge of the current Scientific Cosmology and the Vedic Cosmology of the ancients Hindus. However, for the purpose of circumscription, this approach will be limited to puranic passages where the subject is exposed more extensively and more clearly. That is: chapter 21 of book V of Bhāgavata Purāna (Srīmad Bhāgavatam), book VIII, chapter 15 of Devibhāgavata Purāna and chapter 124 of Matsya Purāna, whose Vaishnavas followers claim to bring together the cosmological tradition of the Vedas. More specifically, attention will focus on the subject of the movement of the Sun, however, one or other times, I will mention and comment on cosmological speculations of passages in other chapters, when the contrasts with current Scientific Astronomy are alarming. Finally, beforehand, it is necessary to

anticipate that, due to primitivism, Vedic Cosmology is full of mythological and fanciful notions about the universe, so many will seem comical to someone familiar with today's sophisticated scientific cosmology.

The Desecration of the Sun

As for the comparison between demystification of imperceptible subjects and perceptible subjects, it is curious to notice the history of the progress of knowledge about the Sun. A mythical character and object of worship in the religions of almost all the peoples of Antiquity (the god Ra of the Egyptians, Utu -Shamash of the Sumerians, Sūrya of the Hindus, Tonatiuh of the Aztecs, Helios of the Greek religion, Sol Invictus of the Romans, etc.), whose gradual increase in scientific knowledge gradually removed its sacredness, as it was discovered that the Sun did not it was that magnificent sublimity that ancient religious people attributed to it. Because the Sun is not only beneficial, it has harmful reactions, such as the emission of ultraviolet rays, X-rays, and solar flares that emit harmful radiation. Depending on the intensity, the individual's exposure to the Sun may cause skin cancer; also, the intense incidence of ultraviolet rays is harmful to the eyes. What largely neutralizes the harmfulness of the Sun is the Ozone Layer, so it is comical to think that the ancients should worship the Sun and, simultaneously, the

Ozone Layer as well, but they were unaware of the existence of this atmospheric layer.



The solar flare

This historical example served to show the difference between attributing divinity to something concrete, therefore investigable (the Sun), and attributing divinity to something abstract, therefore, imperceptible (the supreme god beyond time and space). This is why the religions of the past that worshiped concrete gods, (the Sun, the Moon, the nature, etc.) did not survive, since their objects of worship were demystified and desecrated, while those that worship abstract gods and imperceptible have survived to this day.

Characteristics of the Sun

• Classification: G2V star or Yellow Dwarf star

• Age: 4.6 billion years old, it is currently 30% brighter than it was at the beginning.
• Composition: hydrogen 73%, helium 25%, oxygen 0.9%, carbon 0.4%, iron 0.2%, neon 0.1%, nitrogen 0.1%, magnesium 0.06%, silicon 0, 06% and sulfurous 0.04%.
• Diameter: 1.39 million km (109 times the size of the Earth). If the Sun were the size of a basketball, the Earth would be the size of a pinhead.
• Distance from Earth: approximately 150 million km, so a car at a speed of 80 km / h would take 214 years to reach the Sun.
• Distance from the center of the Milky Way: 27,200 light years, so the Sun and the Solar System are on the periphery of the Milky Way.
• Rotational movement: 25.6 days at the equator and 33.5 days at the poles (because it is gaseous, the Sun does not have a homogeneous rotational movement, just like the Earth, which is a rocky planet)
• Orbital movement: from 225 to 250 million years to complete an orbit around the Milky Way, then it must have completed 20 to 25 orbits since its formation.
• Orbital speed: approximately 251 km / s, at this speed it orbits the Milky Way with the entire Solar System.
• Surface temperature: 5,538º C (10,000º F).
• Core temperature: 15,000,000º C (27,000,000º F)
• Volume: 1.3 million times more than Earth

• Mass: 333 thousand times more than Earth, so something that weighs 35 kg on Earth will weigh about a ton on the Sun.
• Remaining lifetime: 5 billion years as a Yellow Dwarf, when it will become a Red Giant, then it will swallow the planets Mercury and Venus, and then incinerate the Earth.

The Movements of the Sun

The Solar System star is located 2/3 of the way from the center to the circumference of the Milky Way, therefore on the periphery, in one of the spiral arms of the galaxy. The distance from the Sun to the center of the galaxy is about 30,000 light years. The sun orbits the center of the galaxy at a speed of approximately 251 km / s, so, due to the vastness of the Milky Way, it takes approximately 240 million years to complete a full orbit. Since its formation, the Sun has made 20 to 25 orbits. The speeds of the orbits are not uniform due to the irregular distribution of mass in the Milky Way.

The rotational movement of the Sun is similar to that of the Earth, that is, from west to east. However, due to its gaseous nature, the Sun does not uniformly rotate. At the equator, it takes 25 days to rotate around itself, at the poles, 35 days to rotate. This rotational difference does not happen on Earth, since it is not a gaseous planet, but a rocky planet.

In addition to the orbital and rotational movements, the Sun also performs a movement, little known, called barrycentric movement. This is the movement that the Sun makes in response to the gravitational action of the planets that orbit it. That is, it is the displacement of the Sun due to the gravitational action of the planets in the Solar System.

The Birth of the Sun

The Sun was formed 4.6 billion years ago. Briefly, its story is as follows. A cloud of cosmic dust and particles of hydrogen gas swirling in the space between the stars has become dense enough to keep warm. The dust and gas collapsed under the action of gravity itself, and the cloud, called the solar nebula, began to spin and flatten in the direction of a disk. The center of the disc started to glow, as it got hotter and denser. At this stage, the center of the disk, which contained most of the mass, was not yet a star, but a protostar. As soon as the protostar became dense and hot enough, the nuclear fusion process could begin and a star was born. Shortly after the formation of the Sun in the center of the disk, the planets of the Solar System were formed from the debris that circulated the Sun (Langmuir, 2012: 98 and for more details: Baggott, 2018: 146-70).

Since it was formed, the Sun has grown bigger and brighter. It is 30% brighter than it was 4.6

billion years ago. It has already consumed 37% of its hydrogen fuel, converting it to helium. The remaining hydrogen will last for another 5 billion years.

The End of the Sun

The Sun is classified as a medium-sized star, so it will follow the life cycle of stars in this category. In 5 billion years, it will be bigger, hotter and brighter, due to the collapse of its nucleus, then it will become a Red Giant, it will be 170 times bigger than it is today, then it will swallow Mercury from Venus, and the Earth will be incinerated. It will look 2,300 times brighter than it is now. Nothing will survive on Earth.

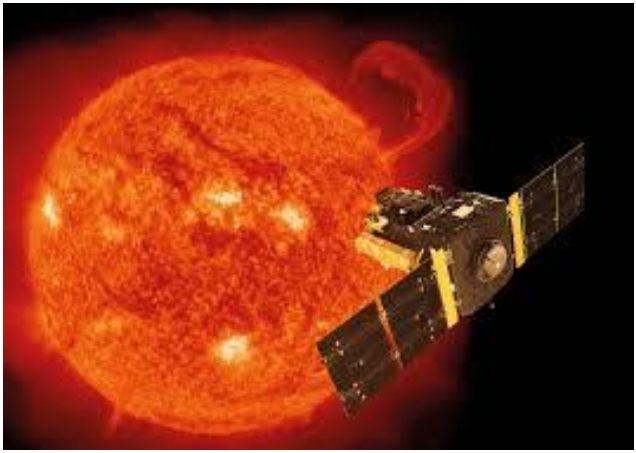
In 3 billion years, the Earth's oceans will evaporate and the surface will be melted. After becoming a Red Giant, the Sun will transform into a White Dwarf. The process will take place as follows. The Sun's core will contract and become much hotter, hot enough to burn helium. When helium runs out, the nucleus will contract again, but nuclear processes will continue, once helium melts into carbon, producing enough energy to stop the contraction. However, carbon cannot become fusion fuel for the Sun, just as it can in the case of larger stars. Then, 50 or 100 million years from now, the Sun's fuel sources will run out. Since carbon burns in its final stages, the outer layers of the Sun will be launched into space, where they are likely to

form a planetary nebula ball, a mass of gas and stardust.

Subsequently, the Sun's core will transform into a White Dwarf star, that is, a hot white ball of very dense matter, the size of the Earth, since the Sun will have no more fuel source, so it will no longer be able to carry out reactions nuclear. Eventually, the sun will cool down, lose all its heat, and finally transform into a dense, cold, dark star known as the Black Dwarf.

Exploration of the Sun

The first space probes for exploration of the Sun were Pioneers 6, 7, 8 and 9, launched between 1959 and 1968. These probes orbited the Sun at a distance similar to that of Earth, made the first detailed measurements of the solar wind and the magnetic field. Pioneer 9 operated for a particularly long time, transmitting data until May 1983. In the 1970s, two Helios spacecraft and Skylab's Apollo Telescope Mount provided scientists with new data on the solar wind and the solar corona. In 1980, the Solar Maximum Mission was launched by NASA. This probe was designed to observe gamma rays, X-rays and ultraviolet radiation from solar flares during a time of high solar activity and sunlight. Launched in 1991, the Japanese satellite Yohkoh observed solar flares in compliance with an X-ray wave.



The probe SOHO around the Sun

One of the most important missions to date has been the Solar and Heliospheric Observatory (SOHO) built jointly by the European Space Agency and NASA and launched in October 1995. Located at the Lagrangain point between Earth and the Sun (where the gravitational attraction of both are equal), SOHO has provided a constant view of the Sun in many aspects since its launch. Solar Dynamics Observatory (SDO) was launched in February 2010.

All of these satellites have been observing the Sun from the plane of the ecliptic, and then have been observing only their equatorial regions in detail. The Ulysses spacecraft was launched in 1990 to study the polar regions of the Sun. The Solar Terrestrial Relation Observatory (STEREO) Mission was launched in October 2006. The Parker

Solar Probe was launched in 2018 and will reach a proximity to the Sun never before reached (0.046 AU) in 2025.[1]

The Purānas

Component texts of a collection of mythologies, histories and traditions of Hinduism, whose composition is attributed to K. D. Vyāsa, the same author of Mahābhārata. According to the Hindu tradition, there are 18 Principal Purānas, known by the name of Mahāpurānas (अष्टदशमहापुराणानि).[2] In addition to these, there are others, occasionally numbering 18, known as Secondary Purānas (अपपुराणानि - Upapurānas). The list of the 18 Mahāpurānas appears in almost all the Principal Purānas, with slight variations in order, as well as, when mentioned, in the number of verses.[3] Below is the list of the 18 Mahāpurānas, with the number of verses, as listed in Bhāgavata Purāna XII.13.04-8:

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[1] A proximity of only 4.3 million miles (6.9 million km) to the Sun, much closer than the nearest planet, Mercury, which is 0.39 AU from the Sun, that is, 36.5 AU million miles (58.5 million km). The Earth is about 94 million miles (150 million km) from the Sun.

[2] Vāyu Purāna II.42.03-11 lists only 16 Mahāpurānas (Tagare, 1988b: part II, 899-900).

[3] To know the divergences in the lists and verse numbers in the different Purānas, see: Tagare, 1986a: part I, xx and Winternitz, 1990: vol. I, 508.

Purāna name	Number of verses
1. Brahma	10 thousand[4]
2. Padma	55 "[5]
3. Vishnu	23 "[6]
4. Vāyu	24 "[7]
5. Bhāgavata	18 "[8]
6. Nārada	25 "[9]
7. Mārkandeya	9 "[10]
8. Agni	15.5 "[11]

[4] Agni Purāna (272.01) mentions 50 thousand, Matsya Purāna (LIII.13): 13 thousand and Vāyu Purāna (II.42.03-11): 10 thousand.

[5] Agni Purāna (272.01) mentions 12 thousand verses, Matsya Purāna (LIII.13): 13 thousand and Vāyu Purāna (II.42.03-11): 55 thousand.

[6] Agni Purāna (272.03): 20 thousand, Matsya Purāna (LIII.17): 23 thousand and Vāyu Purāna (II.42.03-11) omits the mention of this Purāna.

[7] Agni Purāna (272.04) attributes 14 thousand verses to this Purāna, Padma Purāna (LIII.18 :) 24 thousand, Vāyu Purāna (II.42.03-11): 23 thousand, but the current edition has only 10,991 verses (Tagare, 1987: part I, xviii).

[8] Agni Purāna (272.07), Matsya Purāna (LIII.22) and Vāyu Purāna (II.42.03-11) agree on 18 thousand, however, the existing editions of not reach 15 thousand verses (Tagare, 1988b: part II, 899n2).

[9] Agni Purāna (272.08) and Matsya Purāna (LIII.23) agree on 25 thousand, but Vāyu Purāna mentions only 23 thousand.

[10] Agni P. (272.09), Matsya P. (LIII.26) and Vāyu P. (II.42.03-11) agree on 9 thousand.

[11] Agni P. (272.10): 12 thousand and Matsya P. (LIII.28): 16 thousand, Vāyu P. (II.42.03-11) omits the mention of this Purāna.

9. Bhavishya ..... 14.5 "[12]
10. Brahmavaivarta ..... 18 “[13]
11. Linga ..... 11 "[14]
12. Varāha ..... 24 “[15]
13. Skanda ..... 81 “[16]
14. Vāmana ..... 10 "[17]
15. Kūrma ..... 17 “[18]
16. Matsya ..... 14 "[19]
17. Garuda ..... 19 "[20]
18. Brahmānda ..... 12 “[21]

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[12] Agni P. (272.12): 14 thousand, Matsya P. (LIII.32) and Vāyu P. (II.42.03-11) agree on 14.5 thousand.

[13] Agni P. (272.13), Matsya P. (LIII.35) and Vāyu P. (II.42.03-11) agree on 18 thousand.

[14] Agni P. (272.14 and Matsya P. (LIII.38) agree on 11 thousand, Vāyu P. (II.42.03-11) omits the mention of this Purāna.

[15] Agni P. (272.16): 14 thousand, Matsya P. (LIII.39) and Vāyu P. (II.42.03-11) agree on 24 thousand.

[16] Agni P. (272.17): 84 thousand, Matsya P. (LIII.43): 81.1 thousand and Vāyu P. (II.42.03-11): 81 thousand.

[17] Agni P. (272.18), Matsya P. (LIII.46) and Vāyu P. (II.42.03-11) agree on 10,000.

[18] Agni P. (272.19): 8 thousand, Matsya P. (LIII.48): 18 thousand and Vāyu P. (II.42.03-11): 17 thousand.

[19] Vāyu P. (II.42.03-11): 14 thousand, Agni P. and Matsya P. mention this Purāna, but omit the number of verses.

[20] Matsya P. (LIII.54); 18 thousand, Vāyu P. (II.42.03-11): 19 thousand and Agni P. mentions this Purāna, but omits the information on the number of verses.

[21] Matsya P. (LIII.55): 12.2 thousand and Vāyu P (II.42.03-11): 12 thousand. Number of verses omitted in Agni Purāna.

The Matsya Purāna LIII.58 states that the 18 Mahāpurānas together add up to 400 thousand verses (Joshi, 2007: vol. I, 213).

Now, the curious thing is that the Purānas were not composed simultaneously, however, in almost all of them, the list of 18 Purānas is mentioned complete, both in the Purānas composed first and the compounds last. This is an evidence that these passages, with the lists of 18 Purānas, were interpolated when all of them were already composed, because otherwise it could not be possible chronologically.

Meaning of the Word Purāna

The masculine adjective पुराण - purāna means "old", "ancient" or "belonging to ancient times". The neutral noun पुराणं - purānam means "an event in the past", "a tale from the past", "a legend" or "an ancient narrative". In addition, it is the name of a collection of texts that tells myths and stories from the past, known as पुराणं - Purānam.

The Purānas have their roots in Vedic tradition, many legends and episodes of Rg Veda and the Brāhmanas reappear in the Purānas, sometimes in an amplified way. For this reason, it is a fact that there was a modality of ancient narratives, certainly in the form of oral transmission, known in Vedic times as Purāna, sometimes called

the Fifth Veda.[22] Hence, some ancient texts in Hinduism mention the Purānas,[23] but some scholars note that these were not exactly the same texts as the Purānas that exist today. The most indicative examples are the occurrences of quotes from verses of the Purānas, in Vedic times, which do not appear in the current Purānas (Winternitz, 1990: vol. I, 497), also, the Sanskrit style of these quotes is in an old style; therefore, they do not match the most recent Sanskrit style of the current Purānas. Certainly, the Purānas of Vedic times had a different wording than today. For example, ancient texts such as Āpastamba Dharmasūtra I.19.13-4, II.23.04-5 and II.24.06; Vasishtha Dharmasūtra XIV.16-9; Vishnusmrti LVII.11-2 and Manusmrti IV.248-9 reproduce verses from ancient Purānas, which are not found in today's Purānas. G. V. Tagare observed: "The quotations show that the Purānas in those days were compositions in verses in an archaic Sanskrit and that even in those times there

[22] Shatapatha Brāhmana XIII.04.03.13 and Chandogya Upanishd VII.01.02 and 04; 02.01 e 07.01.

[23] Athārva Veda XI.VII.24 and XV.06.04 or 11 (according to the edition); Taittirīya Brāhmana III.12.08.02; Shatapatha Brāhmana XI.05.06.08; 07.09 and XIII.04.03.13; Taittirīya Āranyaka II.10; Chāndogya Upanishad VII.01.02 and VII.07.01; Kautilya Arthashāstra I.05 and Āswalāyana Grihyasūtra III.03.03 (Hazra, 1940: 01; Tagare, 1986a: part. I, xvii and Winternitz, 1990, vol. I, 496).

was a Purāna called Bhavisyat Purāna"[24] (Tagare, 1986a: part. I, xviii).

The sun was worshiped by many ancient people.

Bhāgavata Purāna XII.07.07 and Vishnu Purāna III.06.07 mention the existence of only four original collections of Purānas at the beginning,

[24] A phrase from this Purāna is reproduced in Āpastamba Dharmasūtra II.24.06 (Olivelle, 1999: 67). However, it is not found in the current Purāna with the same name, so it is difficult to say how much that ancient Bhavisyat Purāna resembles or diverges from the current Purāna (Winternitz, 1990: vol. I, 497), listed in eighth place in list of the 18 Mahāpurānas.

transmitted orally, taught by Vyāsa's first disciples. M. Winternitz observed, “The number of these was probably not exactly eighteen at first. Perhaps there were only four, as indicated by the legendary account in Vishnu Purāna. (...) That our current Purānas are not the ancient works themselves that generated these titles, it follows naturally from the fact that none of them satisfies the definition of the Purāna concept, which is provided in the Purānas themselves with respect to their content” (Tagare, 1989a: part V, 2166; Wilson, 1866: vol. III, 63-6 and Winternitz, 1990: vol. I, 499).

A peculiarity of the Purānas is the exaggeration, when Vedic episodes are recounted; sometimes the numbers are exaggeratedly amplified. A very exaggerated example is the episode of the romance between Purūvaras and Urvashī, reported in Rg Veda, hymn X.95.01-18, whose couple is romantically involved for a period of four years (X.95.16), however, this episode is retold in Vishnu Purāna IV.06, 03-6, but the period of the romance is extended to 61 thousand years (IV.06.04). According to M. Winternitz: “as a rule, the younger the Purāna, the more measureless are the exaggerations” (Winternitz, 1990: vol. I, 507). That is why he pointed out the Purānas as "an inferior class of literates, belonging to the lower uneducated priesthood, who were concerned with transmitting the Purānas" (idem: 507).

The Purānas are sectarian texts dedicated to the worship of the gods Vishnu, Shiva and

Brahma. Vishnu, Nārada, Bhāgavata, Garuda, Padma, and Varāha Purānas exalt the god Vishnu. Matsya, Kūrma, Linga, Shiva, Skanda and Agni Purānas exalt the god Shiva and Brahmānda, Brahmavaivarta, Mārkandeya, Bhavishya, Vāmana and Brahma Purānas exalt the god Brahma.

The dates of the Purānas' compositions cannot be precisely determined, so the authors' suggestions vary enormously, whose spectrum extends from the fifth century C.E. until the 14th century C.E. The reason for the divergences in the dates is the abundant presence of old and recent materials side by side in the same text, due to successive additions. To get an idea of the extent of the differences in dating in just one Purāna, see the different authors' suggestions on dating the Bhāgavata Purāna in Tagare, 1986a: vol. I, xxxiv-xxxvii, and for the Purānas dating suggestions in general, Rocher, 1986: 100-4.

The Five Characteristics of Purānas

According to the ancient definition of Amara Kosha I.06.05, for an old narrative to be a Purāna, it must deal with five topics (पञ्चलक्षणानि - Panchalakshanāni):

1) सर्ग - Sarga: creation of the universe

2) प्रतिसर्ग - Pratisarga: recreation after destruction or flood, periodic destruction and renewal of worlds

3) वंश - Vamsha: genealogy of gods and sages

4) मन्वन्तर - Manvantara: the long periods of time with Manu as the ancestor
5) वंशानुचरित - Vamshānucharita: the history of the dynasties.[25]

However, although these topics are defined as the Five Characteristics (Panchalakshanas) of a Purāna, the texts that have come down to us, under the name of Purānas, rarely match this definition, as they include more or less topics than these five characteristics. To put it more accurately, they include many more different topics than limitation in the treatment of Panchalakshanas, such as caste rights and duties, the stages of life (ashramas), rites in general, offerings to the dead, cults, ceremonies and festivals in honor of Shiva and Vishnu, Sāmkhya speculation, Yoga practices, astrology, geography, astronomical speculations, etc.

Dissatisfied with only five topics (Panchalakshanas), the Bhāgavata Purāna deals with ten topics. According to passage II.10.01, the Ten Characteristics (दशलक्षणानि - Dashalakshanas) are as follows:
1) सर्ग - Sarga: the subtle creation of the world (Skandha III)
2) विसर्ग - Visarga: dense creation (Skandha IV)

[25] Agni Purāna, I.14; Garuda P. I.02.27; Kūrma P. I. 01.12; Matsya P. LIII.64; Shiva P. (Vāyavīya Sanhitā, I.41); Vāyu P. IV.10.11 and Vishnu P. III.06.07 (Tagare, 1986: part. I, xviii-xix and Winternitz, 1990: vol. I. 499s).

3) स्थान - Sthāna: the law and order emanating from the Lord (Skandha V)
4) पोषण - Poshana: the protection and well-being of all (Skandha VI)
5) ऊति - Ūti: the luxury of past karma (Skandha VII
6) मन्वन्तर - Manvantara: the Manu period and the stories (Skandha VIII)
7) ईशानुक्था - Īshānukthā: reports of the manifestations of god and his devotees (Skandha IX)
8) निरोध - Nirodha: physical annihilation (Skandha X)
9) मुक्ति - Mukti: liberation (Skandha XI)
10) आश्रय - Āshraya: the final retreat (Skandha XII).

Despite archaism, obsolescence and the fictionality of ideas and practices, the Purānas are still believed, venerated and followed by a multitude of Hindus and followers of New Religious Movements, such as the Hare Krshna Movement. Its followers and apologists believe that they are texts of history, more than mythology, imagination and exaggeration. Its influence is also great in Hindu art, so it is common to find temples decorated with arts reproducing episodes extracted from Purānas. In short, Purānas are more works of imagination than history, although the latter is present in a few passages.

As a counterpoint, the following paragraphs will show and analyze the degrees of conjecturality of puranic astronomy, more specifically, about the

fanciful knowledge about the nature of the Sun and its imaginary movements. For, otherwise, commenting on all the delusive astronomical and astrological ideas dealt with in the Purānas would require a much longer text.

The Shape and Size of the Earth in Purānas

In passage V.21.19 of Bhāgavata Purāna, the mention about the shape and dimension of the Earth appears as follows: लक्षोत्तरं सार्धनवकोटियोजन परिमण्ढलं भूवलयस्य - lakshottara sārdhanakotiyojana parimandalam bhūvalayasya - "The circumference of the Earthy is 95,100,000 yojanas[26] (760,800,000 miles or 1,271,280,000 km).[27] The Devībhāgavata Purāna XV.45 attributes another smaller, but also exaggerated, measure to the size of the Earth: "The Earth measures 90,152,000 krosa yuga yojanas" A krosa corresponds to ¼ of a yojana, then the

[26] The exact measurement of a yojana in miles or kilometers is controversial among authors. Here, I used the measure suggested by A. C. B. Prabhupāda in his translation of Bhāgavata Purāna, that is, a yojana corresponds to 8 miles (12 km).

[27] This mythological measure is extremely exaggerated, when compared to the measure that we know scientifically today. The circumference of the Earth is currently calculated, minus the flattening of the poles, at about 25,005 miles or 40,008 km. The size of the Earth in the measure above is so exaggerated, that it is eight times greater than the distance from the Earth to the Sun, which is 94 million miles or 150 million km.

measurement of Earth in miles, taking into account the measurement of a yojana = 8 miles, it is approximately 180,304,000 miles or 288,486,000 km.[28] This narrative is so mythological that, in the following sentences, it is said that, “The Sun crosses this distance[29] in a moment. He doesn't rest at work for a day; no, not even for a moment” (Vijnanananda, 1890: part II, 775). Even bigger is the size of the Earth mentioned in Matsya Purāna 124.12: “शतार्द्धकोटिविस्तारा पृथिवी - shatārddhakotivistārā prthivī” - The extent (vistāra) of the Earth is 500 million (of yojanas)” (Joshi, 2007: 414).

The Sun God (Surya) in his chariot drawn by seven white horses.

[28] This measurement of the yojana in miles does not match that of the translation by A. C. B. Prabhupāda, as it cannot be 8 miles.

[29] That is, the entire circumference of the Earth.

The translation of the word विस्तार - vistāra is problematic, since it can mean “extension”, “detailed description”, “amplitude” or, more specifically, “diameter”. Therefore, as it translates, it may be referring to either the circumference or the diameter of the Earth, whose measurements are different. The Sanskrit vocabulary has another word with the meanings of "diameter" or "extension": विष्कम्भः - vishkambhah (Apte, 1978: 878 and spokensanskrit.org). If as to the circumference, the measure is equivalent to 4 billion miles or 6.4 billion km. This exaggerated size represents 160,000 times the actual size of the Earth, which is 25,005 miles or 40,008 km in circumference. If it is referring to the diameter, the exaggeration is even greater, since the diameter of the Earth is 7,963 miles (12,742 km). For an idea of the size of the exaggeration, the Sun is only 109 times larger than the Earth. An Earth this size would be almost the size of the Solar System. Vishnu Purāna II.04.07 agrees with this measure: “... the Earth, which, with its continents, its mountains, its oceans and its outer shell, is 50 kotis (500 million) in extension (vistāra - diameter)” (Wilson, 1865, vol. II: 205-6). The measurements of the planets and stars in the Purānas are so delirious that, in passage 124.08, of Matsya Purāna, it is mentioned that the Moon is twice as large as the Sun in circumference (mandala) and in diameter (vishkambhah) (Joshi,

2007: 414). [30]A Moon twice as large as the Sun, in the present distance, would have already collided with Earth, and everything here would not even have started to exist, due to the immense gravitational attraction.

Now, a curious thing is the approximation of the measurement of the diameter of the Earth mentioned in Āryabhatīya, by Āryabhata, an Indian work on 6th century C.E. In verse I.05, the measurement is mentioned, much more modest than those suggested by the Purānas, of 1,050 yojanas for the diameter of the Earth, which corresponds to 12,600 km, since the Earth's diameter being 12,756 at the equator and 12,714 at the poles[31], a difference of 42 km due to the flattening of the poles, therefore a difference of just a few meters. The calculations of the circumference and diameter of the Earth were already made, in ancient Greece, since Erastostenes (273-195 B.C.E.) and by other subsequent Greek researchers. Also curious is the approximation of the measurement of the diameter of the Moon in this same verse, that is, 315 yojanas, the equivalent of 3,780 km, with the Moon's diameter being 3,474 km, therefore a small difference. In contrast, as for the diameter of the Sun, this text was wrong with a monstrous difference, that is, estimated at 4,410

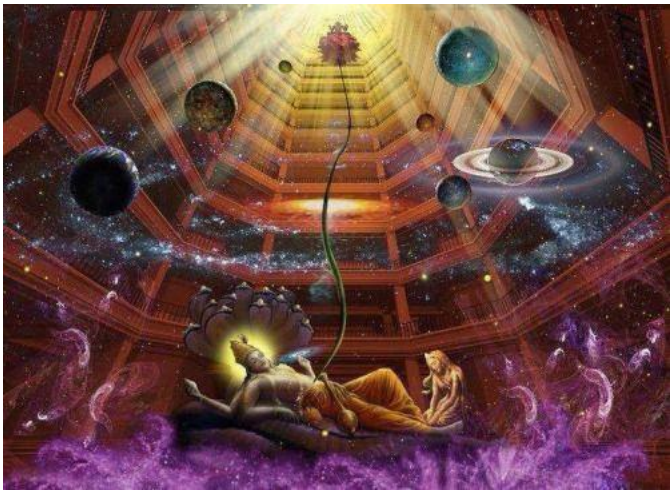
[30] In reality, the Sun is about 400 times larger than the Moon.
[31] The ancients did not know that the Earth is flattened at the poles.

yojanas, which corresponds to 52,920 km, the diameter of the Sun being 1,392,700 km. In addition, it was very wrong to estimate that the diameters of the planets Venus, Jupiter, Mercury, Saturn and Mars are all smaller than the diameter of the Moon, because the ancients did not know the real distance of these planets (Clark, 1930: 15). These were experiments, calculations and speculations made before the creation of the telescope, the history of astronomy is divided into the following periods: before and after the invention of the telescope.

The translation of भूवलयस्य - bhūvalaya by "terrestrial sphere" in the Purānas is a debatable issue. The noun वलय - valaya does not appear in all Sanskrit dictionaries and glossaries in the sense of the sphere, the most common senses are “bracelet”, “ring”, “circle” and “circumference” (Apte, 1978: 835 and spokensanskrit.org). It derives from the verbal root वल् - val, which means "to surround", then the adjective वलयित - valayita: "surrounded", "circled" or "included". A round or circular object is not always a sphere, or a ball. A ring is round (circular), but it is not spherical, whereas a ball is circular and spherical. The difference is that a sphere is a solid body completely round in all its extension, in all its dimensions: height, width and depth, like a ball or a globe, while an object only circular, such as a disk, it is not round in all its dimensions, that is, it is not circular in its depth, only

in height and width, it is circular only as a geometric figure, since it is flat.

Furthermore, the translation of the term भूमण्डल - bhūmandala in the meaning of “terrestrial sphere” also, in the same way as the translation of bhū, is problematic. Mandala is more in the sense of "circle" than "sphere". A circle is a two-dimensional geometric figure (height and width), while a sphere (globe) is a three-dimensional circular body (height, width and depth).



The ancient cosmology mixed astronomy, mythology and astrology.

Then, since all the Sanskrit texts were translated into contemporary languages after the certainty of the sphericity of the Earth, the translators translated Sanskrit words such as bhūvalaya, bhūmandala, bhūbimba by "terrestrial sphere". However, we do not know with certainty

whether the ancient composers had in mind the sense of sphere, ball, or globe, instead of disc, or just circle, when referring to the Earth (bhū). The closest Sanskrit word to a ball or globe is गोल - gola (Apte, 1978: 414 and spokensanskrit.org). In contrast, unlike the Purānas, in a much more precise language, passage IV.07 of Āryabhatīya makes it clear that the Earth is a ball (गोल - gola): "Exactly like a ball formed by a Kabamda flower, it is surrounded by all the sides by shoots, in the same way the Earth is surrounded on all sides by terrestrial and aquatic creatures" (Clark, 1930: 64).

Mythological Notions about the Sun in the Purānas

In passage V.20.43 of Bhāgavata Purāna,[32] the position of the Sun in the universe is specified, as well as the size of the universe: "The Sun is located in the central position of the Egg (अण्ड - anda) of the universe, which is in the center of space between the Earth and the circumference of the Egg (अण्डगोलः - andagolah). The distance between the Sun and the circumference of the Egg is 25 kojis of yojanas (2 billion miles or 3.2 billion km)". According

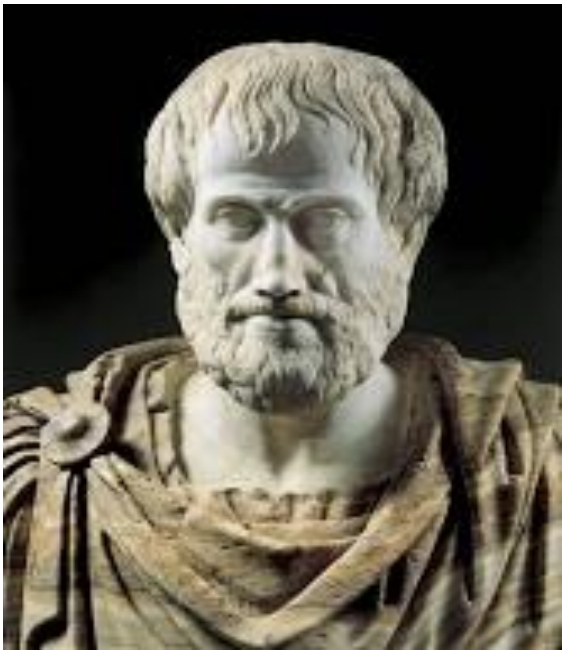
[32] Here were consulted two English translations of Bhāgavata Purāna, that of G. V. Tagare (1986a), that of B. A. C. Prabhupāda (1975) and one French, that of M. Eugéne Burnouf (1844). As in many others, the translations are not coincident, hence the need to consult the Sanskrit text.

to G. V. Tagare (1986a: part II, 745), this measurement above is the radius of the height of the Egg, so the vertical diameter of the universe will be 4 billion miles (6.4 billion km).

The ancient Hindus had the belief that the Sun (सूर्य - Sūrya) was located in the center of the universe, and the universe was shaped like an egg (अण्ड - anda), then they even imagined a size for the universe, without knowing that the universe is constantly expanding. Today we know that the Sun is very far from being at the center of the universe, because we do not even know where the center of the universe is. The Sun is not even at the center of the Milky Way, which is also growing 500 meters per second. However, we now know with certainty that the Sun and the Solar System are located on the periphery of the galaxy.

Despite the oval shape of the universe mentioned in this Purāna, it is possible to calculate, very approximately, the size of the universe imagined by the authors of the Purānas. If the Sun is at the center of the universe, at a distance of 2 billion miles (3.2 billion km) from the circumference of the universe (in the vertical direction of the Egg), then this measure represents the radius of the universe, so just double it to know approximately the diameter of the universe, in the vertical direction, that they imagined, that is 4 billion miles or 6.4 billion km. These are geometrically approximate values, since they imagined a universe in the shape of an egg. Vāmala Purāna chapter XLIII reports that, “in

the creation of the world, the Lord broke the eternal Anda (Primordial Egg) and from it the OM sound emerged. The egg's radiance dried up all the water. Some water has become a highly viscous substance. This viscous matter gradually solidified and became the Earth. The remaining water in the Anda (Egg) became the oceans and rivers" (Mani, 1975: 141).



Aristotle speculated about the universe in his work De Caelo.

For comparison, in order to show how small this measure of the universe in this Purāna is, if we compare it to the dimensions of the Solar System, the oval universe, in the vertical direction, would

only go up to the planet Uranus (1.7 billion miles or 2.8 billion km from the Sun). The planet Neptune (2.8 billion miles or 4.5 billion km from the Sun) and the dwarf planet Pluto (3.6 billion miles or 5.9 billion km from the Sun - Wilson, 2005: 124) would be out of the universe in the vertical direction, but would be within the universe in the horizontal direction (4 billion miles or 6.4 billion km). That is, part of the Solar System would be outside and another part inside the universe. Even more outside the universe would be the nearest star, Alpha Centaur, which is 25.6 trillion miles (41 trillion km) from the Sun. Now, imagine the distances of the billions of galaxies in the universe. Without resources and technology to extract measurements with precision, not only in astronomy, the ancients exaggerated in some numbers and minimized in others.

The ignorance of the precise dimension of things led to absurd comparisons, as in Matsya Purāna 124.06, where it is mentioned, and “the circumference of the Sun is equal to the diameter of Bhāratavarsha (country of the Bhāratas, India) It is 1.080 million miles (1.7 million km) in diameter and the circumference is three times greater” (Joshi, 2007: vol. I, 414). The mentioned diameter almost approached the real size of the Sun (868 thousand miles or 1.39 million km in diameter), but a country with this diameter would not fit even on the planet Jupiter, 86.8 thousand miles (139 thousand km) in diameter. Sometimes, exaggerations and minimizations can happen in the same passage.

Later, in passage 124.20, of this same Purāna, it is mentioned, “the earth has the same measure as the sky” (Joshi, 2007: vol. I, 415). Therefore, either the Earth is too big, because it is the size of the sky, or the sky is too small, because it is the size of the Earth.

The comments are sometimes even stranger. A. C. B. Prabhupāda commented, “the sun is not uninhabited. It is inhabited by living entities and the predominant divinity is Vairāja, or Vivaswān. The difference between the Sun and the Earth is that the Sun is a burning planet, but everyone there has an appropriate body and can live there without difficulty” (1975: Fifth Canto, part 2, 317). Also, that “the theory held by well-known scientists that no one lives there is wrong” (Idem: 1975: 317). Anyway, the notions about the Sun in the Purānas mix a minimum of astronomy, no astrophysics, with a great deal of mythology and astrology. Therefore, it is common in Purānas for an astronomical theme to be explained through mythology. As an example, see the following passage from Matsya Purāna, in which a question of an astronomical nature is answered through a mythological explanation:

“The Rshis asked:

O Suta, the best of speakers, how do planets and stars move in the solar sphere? Do they move collectively or separately? Does someone make them move, or do they move alone? We are looking forward to learning about this secret.

Suta said:
O sages, this is a subject that confuses people, because, although it is visible, it still confuses people.
I will explain this. Among the 14 stars, there is the planetary dolphin (Shishunāra).[33] Uthamapāda's son took the form of this sacrificial pole (medhi) in the sky and is known as Dhruva.[34] It rotates and causes the sun, moon and other planets to rotate as well.
The stars also follow it in its wheel-like motion. These stars move due to Dhruva's willpower, being tied to him by the air rope" (Matsya Purāna 125.02-9).

In the following verses, the author of the explanation, Suta, goes on to speak about the clouds, the wings of the mountains cut by Indra and other themes outside the initial explanation.

The Mythological Movements of the Sun

We now know that the Sun is not stationary, it performs orbital movements around the center of the galaxy and the rotational moment around its

[33] Reference to a constellation in the shape of a dolphin.
[34] Character of an ancient Hindu myth, which was elevated to the position of Polar Star by the god Vishnu. In this belief, the Polar Star, at the top of the universe, is connected to Earth by an immense pole, which supports all the upper worlds, the stars, the planets, the sun and the moon, and makes them revolve around the Earth.

own axis. The ancients also thought that the Sun was not stationary, but with a different mode of movement (गति - gati) than what we recognize today, that is, that it revolved around the stationary Earth. According to the Purānas, the Sun is a tireless traveler, and its orbital movement is not uniform, it performs the movements (गतयः - gatayah): fast (शैघ्र्य - shaighrya), slow (मान्द्य - māndya) and moderate (समान - samānana) (Bhāgavata Purāna V.21.03). A. C. B. Prabhupāda commented: “The Sun is not stationary, it is moving, just like the other planets. The movements of the Sun determine the duration of night and day. When the Sun travels north of the equator, it moves slowly during the day and very quickly at night, thus increasing the length of the day and decreasing the length of the night. In the same way, when the sun travels to the south of the equator, the exact opposite is true, the duration of the day decreases and the duration of the night increases” (Idem, 1975: 319). In Devī Bhāgavata Purāna VIII.15, it is mentioned that the movements of the Sun up and down the equator are strangely pulled by an “air rope” (Vijnanananda, 1890: part. II, 773).

Today we know that what makes the differences in the duration of the day and night, at different times of the year, is not the difference in the speed of the Sun, but rather the relation between the Earth's orbit and the inclination of its axis in relation to the Sun. However, the ancients

did not know about these astronomical phenomena, so they imagined that what determined the differences in the durations of day and night was the difference in the speed of the Sun when it was to the south or north of the equator.

Soon afterwards (V.21.07), it is mentioned that the Sun rotates around a mountain on Earth: “The sages say that a distance of 760.8 million miles (1.217 billion km)[35] is thus covered by the Sun in its rotation (परिवर्तन - parivartana) around the mountain Mānasottara ...”. In the following verses, the Sun continues its journey around the Earth; it passes through the cities of the gods Indra, Yama, Varuna and the god of the Moon. In passage V.21.10, it is specified, “when the Sun leaves (प्रचलते- prachalate) from the capital of Indra, it crosses the distance of 190.2 million miles (304.3 million km)[36] in six hours and arrives (उपयाति- upayāti) to the city of Yama”. In the next verse (V.21.11), the Moon is compared with a planet and with stars. The ancients did not have the resources to differentiate a planet from a star, a satellite, etc. Bhagavad Gītā confirms this identification in passage X.21: "नक्षत्राणामहं शशी– nakshatrānāmaham shashī: of the stars, I am the

[35] Depending on the positions of the planets, with this distance it is possible to get close to the planet Saturn.

[36] Depending on the positions of the planets, it is possible to reach approximately half the way to the planet Jupiter.

Moon".[37] On the uniqueness of the Sun, A. C. B. Prabhupāda issued the following anti-astronomical comment: “Vedic literature informs us that within the universe there is only one Sun, which is mobile. The Western theory that all stars in the sky are different suns is not confirmed in Vedic literature. Nor can we assure you that these stars are the suns of the universe, as each universe is covered by several layers of material elements, and therefore, although the universe is clustered, we cannot see from one universe to another. In other words, whatever we see, it is within this single universe. In each universe there is only one Lord Brahmā, and there are other demigods on other planets, but there is only one Sun” (Prabhupāda, 1975: Fifth Canto, part II, 329). With limited resources, the ancients could not have known that the Sun is just one of the infinite number of stars in the universe. Now, what is disappointing is the fact that author A. C. B. Prabhupāda, who lived in the 20th century, endorsed and, at the same

[37] In order to cover up the astronomical ignorance of this passage, some contemporary translators translated the term नक्षत्राणां- nakshatrānām (of the stars), in the plural genitive case, by: “of the celestial bodies”, “among the orbs of the night”, “of the nocturnal objects”, “Among the lunar mansions”, or for an even more digressive meaning: “as adored by those who confer nakshatras (sukra or stellar) initiations”.

time, attempted to overlap, such a precarious notion of astronomy, such as the early Vedic astronomy.[38]

Another confirmation of the Sun's orbital movement appears in the passages V.22.05 and 07 of the Bhāgavata Purāna, where it is said that "... It is also taught that the season (rtu) is that period (division) of the year in which the Sun crosses a sixth (from its orbit) ". "The sages have taught that the period in which the Sun, with its movements, fast, slow and moderate, completes its circuit in orbit (across the entire length of the sky), together with the terrestrial and celestial spheres ..." (Tagare, 1986: part II, 750). Strangely, the following verse (V.22.08) specifies, "the Moon is observed to be a hundred thousand yojanas (800 thousand miles or 1.2 million km) above the rays of the Sun. Since it (the Moon) is faster in speed (than the Sun), it moves forward (from the Sun)" (Idem, 750).

According to the Purānas, the Sun not only moves around the Earth, but also moves very quickly, due to the immense size of the Earth's

[38] The credulity or not in the old astronomical notions can vary from one author to another. In a very different way, the translator G. V. Tagare, in a note at the beginning of the translation of this chapter on the movements of the Sun, recognized the primitivism of the astronomical ideas of the Purānas, so he observed "This chapter deals with the old astronomical ideas current at the final redaction of this Purāna. It is a popular statement of a scientific subject. (...) The statements given in the Purānas should be considered widely, as modern astronomical accuracy is not to be expected in such works (Tagare, 1986a: part. II, 745n).

circumference (1,134,000,000 miles or 1,814,400,000 km). According to Matsya Purāna 124.46, it performs this route in one day and one night (Joshi, 2007: vol. I, 416). This measurement of the Earth's circumference is immensely exaggerated; the actual measurement of the Earth's circumference is 25,046 miles or 40,075 km at the equator. The reason for such a large circumference may be that, when referring to Earth, the authors are referring, at the same time, to more than one world (Loki), that is, to Bhūrloka (the Earth) and Bhuvarloka (sphere atmospheric), which reaches up to the Sun. Bhūrloka, the terrestrial sphere, is the Earth and the lower regions, hence even the Sun is the Bhuvarloka, or the atmospheric sphere, and from the Sun to the Dhruva (the Polar Star) is the heaven (Maharloka: the sphere of the saints), then Janoloka (the residence of the children of Brahmā), Tapoloka (the sphere of penance) and finally Satyaloka (the sphere of truth). Wherever there is a terrestrial substance, on which to walk, this is the sphere of the Earth (Bhūrloka). The region that extends from Earth to the Sun, in which the Siddhas and other beings move, is the atmospheric sphere (Bhuvarloka) (Vishnu Purāna II.07.02-5 - Wilson, 1865: vol. II, 228-30). Therefore, when the authors mention the circumference of the Earth, it is not always possible to identify whether they are referring only to the terrestrial sphere (Bhūrloka), or also to the atmospheric sphere (Bhuvarloka), which, certainly, is even greater.

The lack of knowledge about astronomy and the natural sciences was so great for the authors, so that some notions even seem delirious. See the following passage from Vishnu Purāna II.08.09: “The radiance of the solar disk, when the sun goes down, is accumulated in the fire, and therefore the fire is visible at a greater distance at night (than during the day). During the last (the day), a quarter of the rays of the fire mix with those of the Sun and, from this union, the Sun shines with greater intensity during the day. (...) When the sun is present, either in the southern hemisphere or in the northern hemisphere, day or night collects in the waters, as they are invaded by darkness or light. It is for this reason that the waters appear dark by day, because the night is within them, and they appear white at night, because at sunset, daylight takes refuge in its bosom” (Wilson, 1865: vol. II, 244-5).[39]

For the Purānas, the Sun is fast and does not move alone, it is accompanied by the Chariot of the Sun God (सौरोरथः - Saurorathah), by the coachman Aruna, who stands in front of the Sun God (Sūrya), but with the face turned to the west as a sign of respect, also by 60 thousand sages called Vālakhilyas, the size of the fourth part of a thumb, who sing the praises of the Sun God. In addition, even more by Gandharvas (heavenly musicians), by Apsarasas (divine maidens), by Nagas (serpents),

[39] A description with few differences is found in Matsya Purāna 128.10-8.

Yakshas (demigods), Yātudhānas (demons) and gods (Bhāgavata Purāna V.21.16-8). Even with all these companions, he is fast, as he crosses the four regions (the cities of Indra, Yama, Varuna and the god of the Moon), that is, a route of 27,206,400 miles (43,530,240 km) in a muhūrta (48 minutes) (Bhāgavata Purāna V.21.12). Even at this stupendous speed, no one is knocked out of the Chariot of the Sun God, the gods have good equilibrium.

The Vedic Planetarium Temple under construction by followers of the Hare Krishna Movement in Mayapur, India.

The size of the carriage is somewhat astonishing, it is 28,800,000 miles (46,080,000 km) long and 7,200,000 miles (11,520,000 km) wide. The yoke that holds the seven horses measures 900,000 miles (1,440,000 km). Horses draw the Sun God (Bhāgavata Purāna V.21.15). Now, note that,

the Purānas authors were so delirious about exaggerating numbers that they did not pay attention to calculations. Note that in verse 12 of chapter 21, it is mentioned that the Sun travels a distance of 27.2 million miles in 48 minutes. Now, this route is not necessary, because the chariot of the Sun God is 28.8 million miles long, therefore longer than the route through the four regions of the gods Indra, Yama, etc., then, with this chariot size, the route is already covered, there is no need to move, let alone 48 minutes to cover it.

The strange thing is that the carriage has only one wheel (एकं चक्रं - ekam chakram) in the form of a year, with twelve spokes (the twelve months of the year), six rings (the six seasons)[40] and three hubs. Its axis is fixed at the top end of Mount Meru and the other end is fixed at Mānasottara Mountain. Fixed to it, the wheel of the Sun's chariot spins, like the wheel of an oil mill, on the mountain Mānasottara (Bhāgavata Purāna V.21.13). Because they are mythological compositions, the puranic descriptions are full of astronomical contradictions. If the axis of the Sun's carriage wheel is fixed on two mountains and rotates on one

[40] The six Indian stations (rtus):
1. Vasanta (Spring) March and April
2. Grīshma (Summer) May and June
3. Varsha (rainy season) July and August
4. Sharad (Autumn) September and October
5. Hemanta (mild winter) November and December
6. Shishira (cold winter) January and February

of them, how is it possible for the Sun to make such a distant trajectory at such an amazing speed, as mentioned in the previous verse (V.21.12)?

The size of the Chariot of the Sun in Garuda Purāna is much smaller. According to passage I.58.01, it measures just nine thousand Yojanas (72,000 miles or 115,200 km) in length. In contrast, the wheel axle is 22 million yojanas (176 million miles or 281.6 million km) long (Idem: I.58.02-3). A second axis of the Sun measures 40,000 yojanas (320,000 miles or 512,000 km) in length (Idem: I.58.04). There are five other axes with 60 thousand yojanas (480 thousand miles or 768 thousand km) in length each (Idem: I.58.05). In the description of Garuda Purāna I.58.02-3, the wheel of the Chariot of the Sun has only five spokes, instead of 12 spokes, just like the description of Bhāgavata Purāna V.21.13. Further on in Garuda Purāna I.58.22-30, it is mentioned that there are the chariots of the Moon (with three wheels), the chariot of the Sun of the planet Mercury (Budha), the chariot of the Sun of the planet Venus (Shukra), of the Sun of Mars, the Sun of Jupiter, Saturn and the comets, all drawn by magnificent horses.

Digital art showing the Temple of the Vedic Planetarium in Mayapur, India. Work of the Hare Krishna Movement.

This myth of the Chariot of the Sun may have its origins in an older passage of Rg Veda X.85, a very mythological passage, therefore difficult to understand the meaning behind the symbols, as well as, with a confusing wording, consequently the divergences in the translations. Passage on which the goddess Sūryā (सूर्या) is delivered in marriage. In verse 10, it is said that “the mind is your chariot”, it is also mentioned that your chariot has three wheels (त्रिचक्रं - trichakram - X.85.14), two wheels are its ears (X.85.11), and the third wheel is hidden (X.85.16. “Sūryā rode the Chariot of Mind, going to his master (X.85.12).

The Astrological Movements of the Sun

The trajectory of the Sun through the signs of the zodiac is noted in Bhāgavata Purāna V.21.04-5:

> “When the Sun passes through the signs of Mesha (Aires) and Tulā (Libra), the days and nights are of equal duration. When he passes through the five signs from Vrshabha (Taurus) to Kanyā (Virgo), the days increase and the duration of the night decreases by one ghatikā (24 minutes) per month”.
>
> "When he passes through the five signs from Vrshchika (Scorpio) to Mīna (Pisces), the days and nights remain in reverse order (the days increase and the nights decrease)"

Therefore, Bhāgavata Purāna insists that the Sun moves (चरति - charati), and the longer or shorter duration of days and nights depends on its movement. Now, there is a passage in Vishnu Purāna II.08.07 that reminds us of heliocentrism, in which the sun is mentioned as stationary: “There is, in fact, neither sunrise nor sunset, because it (the sun) is always (fixed) ... ” (Wilson, 1865: vol. II, 241). However, this stationary view of the sun is contradicted in the following passage of the same work: “When the sun has crossed the center of Pushkara, 1/30 part of the circumference of the globe, its course is equal in time to a muhurta (48 minutes), and swirling like the circumference of a ceramist's wheel, it (the sun) distributes day and

night over the Earth. At the beginning of its northern course, the sun passes to Capricorn, from there to Aquarius, from there to Pisces, going successively from one sign of the Zodiac to another. After passing through these, the sun reaches its equinoctial movement (the inverse equinox), when it makes the duration of the day and night equal. Thereafter, the length of the night decreases and the day increases, until the sun reaches the extremity of Gemini, when it proceeds in a different direction and enters Cancer, its descent to the south begins" (Wilson, 1865: Vol II, 245-6).

Since the ancients did not know the Earth's orbital movement around the Sun, they imagined that the year was governed by the circular movement of the Sun through the constellations of the zodiac. "The Sun moves along the Wheel of Time in the middle of the sky, halfway between the Earth and the sky, and experiences twelve months known by signs of the zodiac as (twelve) divisions of the year" (Bhāgavata Purāna V.22.05).

A curious resemblance is the artifact known as the Sun Trundholm Carriage, a small statue found on the Odsherred peninsula on the island of Zealand in Denmark in 1902, which is currently on display at the National Museum of Denmark. The artifact reproduces a horse-drawn carriage, with an upright disc at the rear, representing the Sun. The piece was dated in 1400 B.C.E. by the Museum, but there are differences among the researchers. It may have been used as a calendar.

The Inadequacy of a "Vedic Planetarium"

The study above dealt only with the question of the movements of the Sun in the Purānas, where other astronomical subjects are dealt with, the planets, the Moon, the stars, the comets, the mythological geography of the Earth, etc. Dealing with them all here would require a much more extensive study. However, only with the knowledge of the fantastic movements of the Sun is it possible to project how fantastic the treatment of other astronomical subjects is, due to the imaginativeness of speculations. However, when we study these notions about the Sun in the Purānas, from a historical perspective, we find a rich collaboration for the knowledge of the history of cosmological ideas in Ancient India. Knowing that, since antiquity, the Indians already showed curiosity for the knowledge of the sky, although the first records are involved with mythology and astrology, it is culturally enriching for those who, until then, thought that only the Greek, the Babylonian and the Egyptian ancients speculated about the universe. Unlike Aristotle's De Caelo (350 B.C.E.) and Ptolemy's Almagest (2nd century B.C.E.), written in a stray sense of myth, the Purānas retained mythological influences in astronomical texts. Other Indian works recorded astronomical speculations, but with a little more scientificity, these works are: the Āryabhatīya (6th century B.C.E.) by Āryabhata and the Sūrya-Siddhānta (5th to 9th century B.C.E., depending on

the interpolations). That is, while Almagest deals with astronomy, Purānas mix astronomy with mythology and astrology. All these works and others not mentioned here, also from Antiquity, are interesting to know the degree of astronomical knowledge of that time by those peoples, therefore useful for the knowledge of the evolution of astronomical knowledge through the ages.

The interior of the Vedic Planetarium under construction, with the universal chandelier in the center.

Now, it is very different to find astronomical and astrophysical scientificity in these ancient speculative works, such as the Purānas, as do some Hindus, some followers of the New Religious Movements (especially from the Hare Krshna Movement) and some current esotericists, claiming that these mythological speculations serve as a complement to current scientific astronomy. The conviction of the followers of the Hare Krshna Movement is so obsessive, that they are spending millions of dollars on the construction of a gigantic

“Vedic Planetarium” in Mayapur, in the state of Bengal, India, with completion scheduled for the year 2022, based on the fantastic astronomical visions of Book V of Bhāgavata Purāna. On the other hand, we do not know religious people who still incorporate the astronomies of Aristotle and Ptolemy in Western religions. We know that Aristotle's astronomy was very influential in the Middle Ages, but now it serves only as a historical document.

From the current perspective, the proper name for this building would not be “Vedic Planetarium”, but rather “Vedic Astronomy Museum”, due to the antiquity and obsolescence of speculations, because what will be displayed there will reproduce ancient ideas typical of a museum and not scientific astronomy of a planetarium.

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